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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/647,716

08/25/2003

Tai Min

HT02-014

2159

7590

08/04/2005

STEPHEN B. ACKERMAN  
28 DAVIS AVENUE  
POUGHKEEPSIE, NY 12603

EXAMINER

HO, TU TU V

ART UNIT

PAPER NUMBER

2818

DATE MAILED: 08/04/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

H.A

<b>Office Action Summary</b>	<b>Application No.</b>	<b>Applicant(s)</b>	
	10/647,716	MIN ET AL.	
	<b>Examiner</b>	<b>Art Unit</b>	
	Tu-Tu Ho	2818	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

#### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

#### Status

- 1) ☒ Responsive to communication(s) filed on 11 July 2005.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

#### Disposition of Claims

- 4) ☒ Claim(s) 1-18 is/are pending in the application.
- 4a) Of the above claim(s) 1-15 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 16-18 is/are rejected.
- 7) ☒ Claim(s) 16 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

#### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 25 August 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

#### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.

#### Attachment(s)

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)                        | 4) <input type="checkbox"/> Interview Summary (PTO-413)                     |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)               | Paper No(s)/Mail Date. _____  |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| Paper No(s)/Mail Date <u>11/24/2003</u> .  | 6) <input type="checkbox"/> Other: _____                                    |

## **DETAILED ACTION**

### ***Oath/Declaration***

1. The oath/declaration filed on 08/25/2003 is acceptable.

### ***Election/ Restriction***

2. Applicant's election with traverse of Invention II, claims 16-18, in the reply filed on 07/11/2005 is acknowledged. The traversal is on the ground(s) that (1) forming the device by etching is speculative and that (2) the fields of search for the different inventions are co-extensive.

These are not found persuasive because (1) etching is one of various ways an artisan could utilize in forming the device - and therefore not speculative; and because (2) the fields of search for the different inventions being co-extensive is speculative; the different classifications are created because they are not co-extensive.

The requirement is still deemed proper and is therefore made FINAL.

3. Claims 1-15 are withdrawn from further consideration pursuant to 37 CFR 1.142(b), as being drawn to a nonelected invention, there being no allowable generic or linking claim. Applicant timely traversed the restriction (election) requirement in the reply filed on 07/11/2005, as noted above.

### ***Claim Objections***

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4. Claim 16 is objected to because of the following informalities: claim 16 contains a typographical error (line 7, "photolithography"). Appropriate correction is required.

***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. §103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

5. **Claim 16** is rejected under 35 U.S.C. §103(a) as being unpatentable over Kishi et al. U.S. Patent Application 20020130339 (the '339 reference).

The '339 reference discloses a method for fabricating a magnetic tunnel junction (MTJ) cell ("TMR", paragraphs [0005] and [0024]), said cell having a narrow dimension at its middle, comprising:

forming an MTJ layered stack (91/92/93, Figs. 9's); and

patterning within said stack, by photolithography and ion-milling methods (paragraph [0115]), at least one MTJ cell having a narrow dimension at its middle (Figs. 2, 5-6, and 9, particularly Fig. 2, paragraphs [0077] and [0098], particularly the teachings: "The plane shape can also be applied to all layers of the device").

However, the reference fails to teach that (1) whereat (at the middle whereat the dimension is narrow) artificial nucleation sites for magnetization switching are formed, (2) said cell having a reduced sensitivity to defects and shape irregularities, and (3) the magnetic layers of said stack having a common crystalline anisotropy.

Nevertheless, with respect to the limitations (1) and (2), since the claimed method and the disclosed method use the same materials (present invention, pages 8-13; the '339 reference, paragraphs [0035]-[0037]), and in the end, produce the same product (patterning within said stack, by photolithography and ion-milling methods, at least one MTJ cell having a narrow dimension at its middle), the disclosed method should also produce a device with the claimed limitations (1) and (2). As for (3), since the reference fails to disclose otherwise, namely failing to disclose that the magnetic layers of said stack having different crystalline anisotropies, it appears that the reference discloses that the magnetic layers of said stack have a common crystalline anisotropy; furthermore, since Applicant has been quiet in the specification as to the novelty of the limitation, the limitation appears to be arbitrary and therefore would have been obvious.

**6. Claims 17-18** are rejected under 35 U.S.C. §103(a) as being unpatentable over Kishi et al. U.S. Patent Application 20020130339 (the '339 reference) as applied above for claim 16 and further in view of Nguyen et al. U.S. Patent Application 20040130936.

The '339 reference discloses a method for fabricating a magnetic tunnel junction (MTJ) cell as claimed and as detailed above for claim 16, and further discloses:

forming a ferromagnetic free layer (91 or 93, paragraph [0098]);

forming an insulating tunneling layer ("nonmagnetic dielectric" 92, paragraph [0114]) on said free layer;

forming a multi-layered magnetically pinned layer (93 or 91, paragraphs [0100], and note that the multi-layered layer could be for the free layer or the pinned layer, as the reference does

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not specifically assign the reference numerals to the functions) on said tunneling layer, said pinned layer formation further comprising:

- forming a first ferromagnetic layer (91-1) adjacent to said tunneling layer;
  - forming a non-magnetic (96) coupling layer on said first ferromagnetic layer;
  - forming a second ferromagnetic layer (91-2) on said coupling layer;
  - forming an antiferromagnetic pinning layer (paragraph [0099]) on said second ferromagnetic layer; and
- forming the free layer as a multi-layered layer, similarly to the pinned layer without the antiferromagnetic layer (as the reference does not specifically assign the reference numerals 91 and 93 to the free layer and the pinned layer, 91 and 93 applies equally to the free layer and the pinned layer).

However, the reference does not teach that wherein said multi-layered magnetically pinned layer or free layer has a net magnetic moment which is substantially zero as a result of the magnetic moments of said first and second ferromagnetic layers being substantially equal and maybe weakly or strongly magnetically coupled in an anti-parallel configuration.

Nguyen, in also disclosing a method for fabricating a magnetic tunnel junction (MTJ) cell, teaches that the multi-layered ferromagnetic layer (synthetic magnetic layer) should have a zero magnetic moment so as to be immune or less susceptible to stray and external fields (paragraph [0077]).

Therefore, it would have been obvious to form the reference's device such that the net magnetic moment of the multi-layered ferromagnetic layer is zero. One would have been motivated to make such a change in view of the teachings in Nguyen that such a change enables

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the multi-layered ferromagnetic layer to be immune or less susceptible to stray and external fields.

*Conclusion*

7. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Tu-Tu Ho whose telephone number is (571) 272-1778. The examiner can normally be reached on 6:30 am - 5:00 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, DAVID NELMS can be reached on (571) 272-1787. The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

  
Tu-Tu Ho  
July 29, 2005